

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

October 25, 1967

Project Title: Casting Techniques for Three Dimensional Models

Project No.: A-1048-001

Project Director: Lee H. Knight

Sponsor: American Charts Company

Effective October 18, 1967 Estimated to run until: Open

Type Agreement: Industrial Agreement Amount: \$3100.00 *

Reports: As Required

Contact Person: Mr. H. R. Stanfield
American Charts Co.
3185 Maple Drive, N. E.
Atlanta, Georgia 30305

* Funds for Phase I only, approximately one month in duration. Project consists of four (4) phases; continuation is contingent upon successful completion of Phase I.

Assigned to ... Mechanical Sciences Division

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GEORGIA INSTITUTE OF TECHNOLOGY

Engineering Experiment Station

PROJECT TERMINATION

Date 11/4/70

PROJECT TITLE: Casting Techniques for Three Dimensional Models

PROJECT NO: A-1048-001

PROJECT DIRECTOR: W. H. Burrows

SPONSOR: American Charts Company

TERMINATION EFFECTIVE: October 22, 1970

CHARGES SHOULD CLEAR ACCOUNTING BY: All charges have cleared.

Chemical Sciences & Materials Division

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GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

April 18, 1968



Mr. Homer R. Stanfield
Vice-President
American Charts Company
3185 Maple Drive NE
Atlanta, Georgia 30305

Dear Mr. Stanfield:

Enclosed is a Summary Technical Report of Phase 1 of Project A-1048. It is hoped that the techniques developed by Georgia Tech will serve as an adequate foundation for further work in perfecting a casting procedure. If during your experimenting, you need further technical assistance, please feel free to call on us for additional help.

We look forward to working further with you on the additional phases of this project.

Sincerely,

[Redacted signature area]

John E. Sims
Project Director

JES/cdb

SUMMARY TECHNICAL REPORT - PHASE 1

PROJECT A-1048

CASTING TECHNIQUES FOR THREE DIMENSIONAL MODELS

SUMMARY

The Georgia Tech Engineering Experiment Station developed a casting technique for three dimensional models under phase one of Contract A-1048 for American Charts Co. The process involved: Making vacuum forms from the original model, casting a female mold of the original with a vacuum form in place, and filling the vacuum form with a foam, using the mold for support.

CASTING TECHNIQUE

The casting technique that follows represents what is felt to be the most economical procedure to obtain the presently desired results. It should be noted that if the specifications for the model change or with the advent of new materials, this procedure may be revised to meet the new conditions.

The steps are as follows:

1. Construct the master model from cardboard or any other suitable material. This model will be constructed in essentially the same manner as all present models with care being taken not to have any undercut areas. All vertical surfaces must either be vertical or preferably have small positive draft angle to allow for easy release from the mold.

(Steps 2 and 3 may be interchanged as experience dictates).

2. Paint and letter the model completely. All required photographs of the model should then be made since succeeding steps may damage the master model.

NOTE: While this is the procedure used to date, Georgia Tech recommends some experimentation with making the vacuum forms from the unpainted master and then decorating one of the vacuum forms while on the master. Photographs of this master vacuum form model would be used in the reproduction steps.

3. Make as many vacuum forms as desired. Allowances should be made for the fact that at least one vacuum form may be destroyed in the process of making the female mold.

4. To cast the female mold, construct a form around the master model with a vacuum form in place. Mix the required amount of Ultracal 30 according to the instructions on the bag and fill the form making sure that all portions of the model are covered by at least one inch of material. Care should be taken to keep the form as level as possible. Allow the mold to cure completely before removing the master model and vacuum form.

5. Measure the volume of the of the female mold by filling it with water. A vacuum form should not be used during this procedure. It should also be noted that minor flaws in the surface of the female mold are unimportant; major flaws should be patched using Ultracal 30. The mold should be thoroughly dry before proceeding.

6. A vacuum form is then placed in the female mold and a quantity of Isofoam sufficient to fill the cavity is poured into the vacuum form. The mold should then be capped with a plate capable of withstanding a

force of approximately 50 pounds per square foot. The side of this plate in contact with the foam should be coated with the release agent recommended by the foam supplier to facilitate easy removal after the foam is set. IT SHOULD BE NOTED THAT THE PROPER QUANTITY OF FOAM CONSTITUENTS AND THOROUGH MIXING ARE ESSENTIAL TO OBTAINING A UNIFORM FOAM.

7. After the foam has been allowed to set for 1 to 2 hours, the foam filled vacuum form can be carefully removed from the female mold. The replica should be mounted on a flat surface to prevent warping.

After the above steps, the replica should be ready for the photographic decorating process.

The above process was used to produce a 'stepped' replica on which the contour lines are easily identified. If it is desirable to produce a smooth replica that represents the actual ground surface, the original male model can be filled with either a material such as plaster of paris or one of the many thixotropic resins that are available. We were unable to find any method of filling the model other than going through a hand filling and finishing process. When the smooth male model is completed, vacuum forms can be made from this model and steps 2 through 7 above can be followed.

The suppliers of the mold material and the foam used by Georgia Tech were:

Mold Material - Ultracal 30

Supplier - U. S. Gypsum Co.
3098 Piedmont Rd., NE
Atlanta, Georgia

Foam - Isofoam PE-2A
Isofoam PE-2B
(Equal quantities of each)

Supplier - Uniglass Industries
Glascoat Division
1400 Hills Place, NW
Atlanta, Georgia

Respectively submitted,



✓ John E. Sims
Project Director

JES/cdb